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(71) Applicant: **Marmi Zenatelli S.A.S**
37020 Volargne (Verona) (IT)

(72) Inventor: **Zenatelli, Giorgio**
37010 Pacengo di Lazise (Verona) (IT)

(74) Representative: **Bettello, Pietro, Dott. Ing.**
Studio Tecnico
Ingg. Luigi e Pietro Bettello
Via Col d'Echele, 25
36100 Vicenza (IT)

(54) Process for the correction treatment of the pulp in a granite-cutting unit

(57) The invention concerns a process for the correction treatment of the pulp in a granite-cutting unit, of the type in which the pulp (1), contained in the pit (2), through the pump (3), is thrusted through the duct (4), up to the sprays (5), which sprinkle the block of granite (6) being cut. Branches equipped with intercept valves (7) are applied onto the duct (4), to which branches a drainage apparatus, such as a cyclone (8) and the control apparatus (9) are connected. Such a process is characterised in that the specific weight value of the pulp can be changed, to take it back to optimal values, without changing the optimal value of the viscosity of the pulp itself.

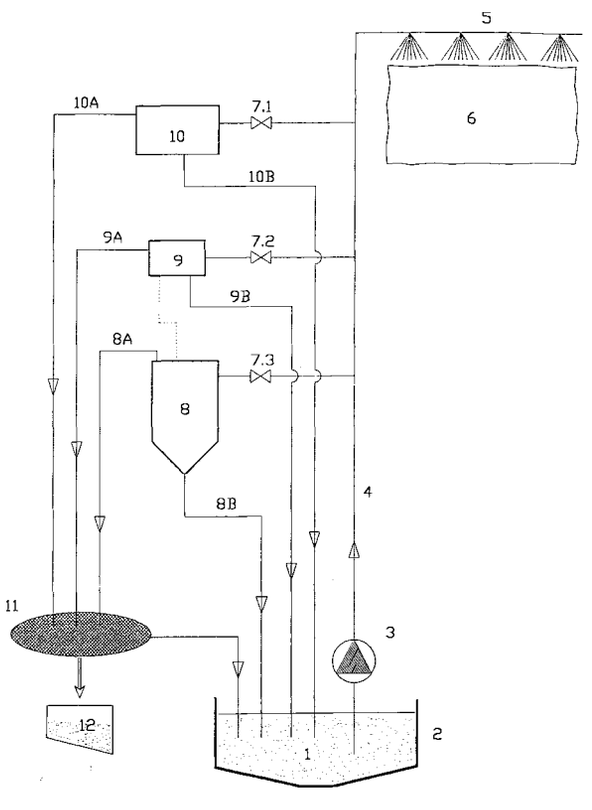

FIG.1

EP 1 486 308 A2

Description

[0001] The present finding concerns a process for the correction treatment of the pulp in a granite-cutting unit.

[0002] The abrasive pulp, consisting of water - lime-wash - granite dust - waste from the blades and steel shots, the real "tool" of the cutting group, possibly with a non-metallic abrasive substance, specifically added, generally comes with a suspension of solid substances in a saturated aqueous Calcium hydroxide solution - ($Ca(OH)_2$) - where water represents about 2/3 in volume and slightly more than 1/3 in weight of the whole mixture.

[0003] Granite dust constitutes a substantial percentage, both in weight and in volume, of the abrasive pulp and has an average specific weight of about 2.65, against a specific weight of 1 of water, a specific weight of 7.5 of steel and a specific weight of 1.75 of the pulp itself; it follows from this that the dust constitutes 1/5 the volume and about 1/3 the weight of the pulp.

[0004] The granules of steel shots, which have an initial particle size distribution of between 0.5 and 1.5 mm, with repeated passages through the frame are gradually broken up or ground down, until they reach a size, fixed at the value of 0.3-0.4 mm (large shots), below which said granules (fine shots) are no longer considered useful to continue to cut with optimal speed.

[0005] The waste from the blades, which are worn down during cutting, consists of a "dust" of metallic particles with a maximum size of 1/10 microns.

[0006] The pulp circuit comprises a large pump that operates in a closed circuit, drawing the pulp from a pit and sending it, through piping, above the highest part of the frame, where a container takes care of distributing the pulp to the so-called "sprays", which sprinkle it over the blocks of granite and on the blades that are cutting.

[0007] The abrasive pulp then runs into the cuts formed by the blades and leaves spraying the whole block and the block-holding trolley, finally falling onto a lower hopper, where a duct takes it back into the pit.

[0008] In the piping that connects the pump to the container of the sprays branches are applied, each of which is equipped with an intercept valve, one of which is used for connection with the "drainage" apparatus, in the state of the art consisting of a cyclone; another of said branches is connected to the apparatuses for controlling the chemical-physical properties of the pulp in circulation.

[0009] In the cyclone, by centrifuge, the pulp divides into two fractions, since the steel shots tend to go onto the walls of the cyclone and fall to the bottom and are then once again collected in the pit, where they are put back into circulation by the pump; vice-versa, most of the water (which contains almost all of the granite dust, most of the shots that had become fine and barely abrasive, as well as the very fine waste from the blades) escapes at the top and becomes waste.

[0010] The most significant parameters that define the pulp are: viscosity, specific weight and values of the amount and size of the shots.

[0011] Viscosity has a great influence upon the cutting of granite since:

a) the pulp must penetrate all the way into the cut made by the blades, in a sufficient amount to continue with the cutting, which is mainly carried out by the steel shots, passing into the thin free space existing between the blades and the granite; if it is too viscous the pulp does not manage to pass entirely, work is lost and "its height diminishes", whereas if the pulp is not very viscous the large shots are not "supported" by the pulp itself and remains in the cut for a long time, accumulating under the blades, which tend to deviate, with the consequence of a bad cut;

b) in the separator cyclones, where the steel granules of a size advantageous for cutting are recovered by centrifugal action, if the viscosity is too high some of the useful shots do not manage to reach the wall and remain in the fluid, which goes out in the upper part of the apparatus, thus losing shots that are still useful whereas, vice-versa, when the pulp is not very viscous, an excessive amount of fine shots goes down to the bottom of the apparatus and wastefully goes back into the pit.

[0012] The value of the specific weight is mainly influenced by the amount of "iron" present in the mixture in the form of shots (large or fine) and iron dust (used blade) for which reason, in operation, when the control apparatus indicates a value of the specific weight of the pulp greater than the nominal value (about 1.7), so as not to reduce the performance of the frame it is necessary to intervene immediately, so as to take a percentage of the metallic component (fine shots) away from the mixture.

[0013] In the current state of the art, such an operation is realised with the use of the cyclone, which, however, has the drawback that, due to the way it operates, it inevitably also involves a variation in the value of the viscosity of the mixture, whereas such a value should always remain optimal.

[0014] Such a negative situation occurs, above all, during the cutting of blocks of particularly hard and/or abrasive material, as well as at the start of each frame or starting step of the frame, in which the pulp contains, as well as the pulp of the previous operation, also small amounts of fine shots and waste from the blades, deriving from the washing of the frame and deposited in the hopper, in the discharge pipe and in the pit.

[0015] The purpose of the present finding is that of realising a process for the correction treatment of the pulp in a granite-cutting unit, which allows the specific weight of the pulp to be taken back to nominal values, without changing the nominal value of the viscosity of the pulp itself.

[0016] Such a purpose is obtained through the use of a magnetic iron-removal apparatus, applied on one of the branches present on the delivery duct of the pulp.

[0017] In the operative step, such a magnetic iron-removal apparatus has the task of completely separating the metallic component, large shots, fine shots and waste from the blades from the rest of the components of the mixture, which, thus purified, is discharged into the pit and pit back into circulation.

[0018] The unit according to the finding is completed with a vibrating sieve, which has the purpose of sieving the metallic particles of a size greater than a preset value, usually 0.3-0.4 mm, from the remaining metallic part; in practice, the large shots are recovered, whereas the fine shots and the iron dust are sent to the discharge for mud treatment or into an iron-collection tank.

[0019] The finding also foresees that the piping for the discharge of the cyclone and for the control apparatuses converge on the vibrating sieve, so as to be able to completely recover the particles of a size greater than 0.3-0.4 mm, consisting of large shots and of non-metallic abrasive substance, when it has been added into the pulp to improve the cutting characteristics, which would otherwise have been sent to the discharge, with substantial economic consequences.

[0020] Operatively, the finding foresees that, in a first embodiment of the unit, the iron-removal apparatus is placed upstream of the vibrating sieve, whereas, in a second embodiment, when it is required that the recovered metallic component that has been but back into circulation must not be magnetised, the aforementioned iron-removal apparatus is arranged downstream of the vibrating sieve.

[0021] The finding shall be better understood through the description of some possible embodiments, given only as a non-limiting example, with the help of the attached tables of drawings, where:

- fig. 1 (Table I) represents a diagram of a first embodiment of the unit, for realising the process according to the finding;

- fig. 2 (Table II) represents a diagram of a second embodiment of the unit, for realising the process according to the finding;

- fig. 3 (Table III) represents a diagram of a third embodiment of the unit, for realising the process according to the finding;

[0022] As can be seen in the figures, the pulp 1 contained in the pit 2, through a pump 3, is thrusted through the duct 4 up to the sprays 5, which sprinkle the block of granite 6 being cut.

[0023] On the duct 4 branches are formed, equipped with intercept valves 7, to which at least the cyclone 8 and the control apparatus 9 are connected, all according to *per* se known methods.

[0024] As can be seen in fig. 1, in a first embodiment of the process according to the finding, a magnetic iron-removal apparatus 10 is connected onto a branch, equipped with the intercept valve 7.1, of the duct 4 of the pulp.

[0025] In the operative step, the cyclone 8 separates the pulp going in, regulated by the intercept valve 7.3, into two flows:

- a first over flow 8A consisting of fine shots "Gf", waste from the blades "S1", a lot of water "H", almost all of the granite dust "Sg" and almost all of the non-metallic abrasive substance "A", if present;

- a second under flow 8B with the outlet of the large fraction, consisting almost entirely of large shots "Gr", a little water "H" and a little granite dust "Sg", which is conveyed directly into the pit 2 and put back into circulation by the circulation pump.

[0026] In the operative step, the magnetic iron-removal apparatus 10 separates the pulp going in, regulated by the valve 7.1, into two flows:

- a first flow 10A, that collects all of the metallic component present in the mixture, i.e. the shots, fine and large "Gf+Gr" and the waste from the blades "S1";

- a second flow 10B, which collects the mixture thus purified, thus containing water "H", granite dust "Sg" and non-metallic abrasive substance "A", which is conveyed directly into the pit and put back into circulation.

[0027] As can be seen again in fig. 1, the two flows 8A and 10A, of the cyclone 8 and of the magnetic iron-removal apparatus 10 respectively, are conveyed onto a vibrating sieve 11, which takes care of the mechanical separation of the particles present in the two flows, of a size greater than 0.3-0.4 mm, from the rest of the mixture, which is discharged into the collection tank 12.

[0028] To further increase the yield of the unit the plant foresees that the flow "9A" of the control apparatus 9 is also conveyed onto the vibrating sieve 11 so as to recover, after measuring, the possible large shots "Gr", which have not been discharged with the flow "9B" of the "wet iron", which is conveyed directly into the pit 2.

[0029] In practice, with the introduction of the vibrating sieve 11 and the conveying onto it of the aforementioned three flows 8A, 9A and 10A, it is thus possible to also recover and definitively put back into circulation in the pit 2 the part of large shots "Gr" that otherwise would have gone to the discharge, as well as it being possible to also recover a substantial percentage of non-metallic abrasive substance "A", with unquestionable positive aspects from the economic point of view.

[0030] As can be seen in figures 2 and 3, in the second

embodiment of the unit according to the finding a branch is foreseen, intercepted by the valve 7.1, which conveys a flow of pulp directly from the duct 4 to the vibrating sieve 11; the iron-removal apparatus 20-30 is positioned downstream of the aforementioned vibrating sieve; in such a way one can separate the metallic component of a size greater than 0.3-0.4 mm, i.e. the large shots "Gr" are recovered to be reused without them being magnetised.

[0031] Specifically, as can be seen in fig. 2, in a second embodiment of the process according to the finding, the iron-removal apparatus 20, positioned downstream of the vibrating sieve 11, collects all of the pulp that is not held by the sieving action of the vibrating sieve 11, i.e. the particles of a size smaller than 0.3-0.4 mm, that is fine shots "Gf", waste from the blades "S1", non-metallic abrasive substance "A", granite dust "Sg" and water "H" and divides it into two flows:

- a first flow 20A, which collects the metallic component of a size smaller than 0.3-0.4 mm, which can be collected in an iron collection container 13 or discharged into the collection tank 12;

- a second flow 20B, which collects all of the mixture, without the metallic component, which is sent to the pit 2 for recirculation.

[0032] Again specifically, as can be seen in fig. 3, in a third embodiment of the process according to the finding, the iron-removal apparatus 30, again positioned downstream of the vibrating sieve 11, of the type that has two sieving chambers, is fed only by the flow of the pulp conveyed by the branch regulated by the valve 7.1 and divides it into two flows:

- a first flow 30A, which collects the mixture without the metallic component and which is sent to the pit 2;

- a second flow 30B, made up of the metallic component, consisting of fine shots and waste from the blades (Gf+Sl) which is sent into the collection tank 12.

[0033] Embodiments different to the one described are also possible, according to the size and functional characteristics of the unit, without, for this reason, departing from the scope of the following claims.

Claims

1. PROCESS FOR THE CORRECTION TREATMENT OF THE PULP IN A GRANITE-CUTTING UNIT, of the type in which the pulp (1), contained in the pit (2), through the pump (3), is thrusted through the duct (4), up to the sprays (5), which sprinkle the block of granite (6) being cut, wherein branches equipped with intercept valves (7) are applied onto the duct (4), to which branches a drainage apparatus, such as a cyclone (8) and the control apparatus (9) are connected,

   said process being **characterised in that** the specific weight value of the pulp can be changed, to take it back to optimal values, without changing the optimal value of the viscosity of the pulp itself.

2. PROCESS FOR THE CORRECTION TREATMENT OF THE PULP IN A GRANITE-CUTTING UNIT, according to claim 1, **characterised in that** it foresees the use of a magnetic iron-removal apparatus (10, 20, 30) applied on a branch, regulated by the intercept valve (7.1), of the delivery duct (4).

3. PROCESS FOR THE CORRECTION TREATMENT OF THE PULP IN A GRANITE-CUTTING UNIT, according to claim 2, **characterised in that** it foresees the use of a vibrating sieve (11) for the recovery of the large shots and of the non-metallic abrasive substance.

4. PROCESS FOR THE CORRECTION TREATMENT OF THE PULP IN A GRANITE-CUTTING UNIT, according to claims 2 and 3, **characterised in that** the iron-removal apparatus (10) is placed upstream of the vibrating sieve (11).

5. PROCESS FOR THE CORRECTION TREATMENT OF THE PULP IN A GRANITE-CUTTING UNIT, according to claims 2 and 3, **characterised in that** the iron-removal apparatus (20, 30) is placed downstream of the vibrating sieve (11).

6. PROCESS FOR THE CORRECTION TREATMENT OF THE PULP IN A GRANITE-CUTTING UNIT, according to claim 4, **characterised in that** the magnetic iron-removal apparatus (10) separates the pulp going in into two flows: a first flow 10A, that collects all of the metallic component present in the mixture, i.e. the shots, fine and large and the waste from the blades and a second flow 10B, consisting of the mixture thus purified, thus containing water, granite dust and part of the non-metallic abrasive substance, which may have been added, which is conveyed directly into the pit (2) and put back into circulation.

7. PROCESS FOR THE CORRECTION TREATMENT OF THE PULP IN A GRANITE-CUTTING UNIT, according to claim 6, **characterised in that** the flow (10A) going out from the magnetic iron-removal apparatus (10) is conveyed onto the vibrating sieve (11), which takes care of the mechanical separation of the metallic particles constituting the large

shots, which are of a size greater than 0.3-0.4 mm from the rest of the mixture.

8. PROCESS FOR THE CORRECTION TREATMENT OF THE PULP IN A GRANITE-CUTTING UNIT, according to one or more of the previous claims, **characterised in that** the flows (8A) and (9A) going out, respectively, from the cyclone (8) and from the control apparatus (9), are conveyed onto the vibrating sieve (11), which takes care of holding the particles, mainly consisting of large shots, of a size greater than 0.3-0.4 mm.

9. PROCESS FOR THE CORRECTION TREATMENT OF THE PULP IN A GRANITE-CUTTING UNIT, according to claim 5, **characterised in that** it foresees a branch, intercepted by the valve (7.1), which conveys a flow of pulp directly from the duct (4) to the vibrating sieve (11).

10. PROCESS FOR THE CORRECTION TREATMENT OF THE PULP IN A GRANITE-CUTTING UNIT, according to claim 9, **characterised in that** the iron-removal apparatus (20), positioned downstream of the vibrating sieve (11), collects all of the pulp that is not held by the sieving action of the vibrating sieve, i.e. the particles of a size smaller than 0.3-0.4 mm, that is fine shots, waste from the blades, non-metallic abrasive substance, granite dust and water and takes care of dividing it into two flows: a first flow (20A), which collects the metallic component of a size smaller than 0.3-0.4 mm, which can be collected in an iron collection container (13) or discharged into the collection tank (12) and a second flow (20B), which collects all of the mixture, without the metallic component, which is sent to the pit (2) for recirculation.

11. PROCESS FOR THE CORRECTION TREATMENT OF THE PULP IN A GRANITE-CUTTING UNIT, according to claim 9, **characterised in that** the iron-removal apparatus (30), positioned downstream of the vibrating sieve (11), of the type that has two sieving chambers, is fed only by the flow of pulp conveyed by the branch regulated by the valve (7.1) and divides it into two flows: a first flow (30A), which collects the mixture without the metallic component and which is sent to the pit (2) and a second flow (30B), made up of the metallic component containing fine shots and waste from the blades, which is sent into the collection tank (12).

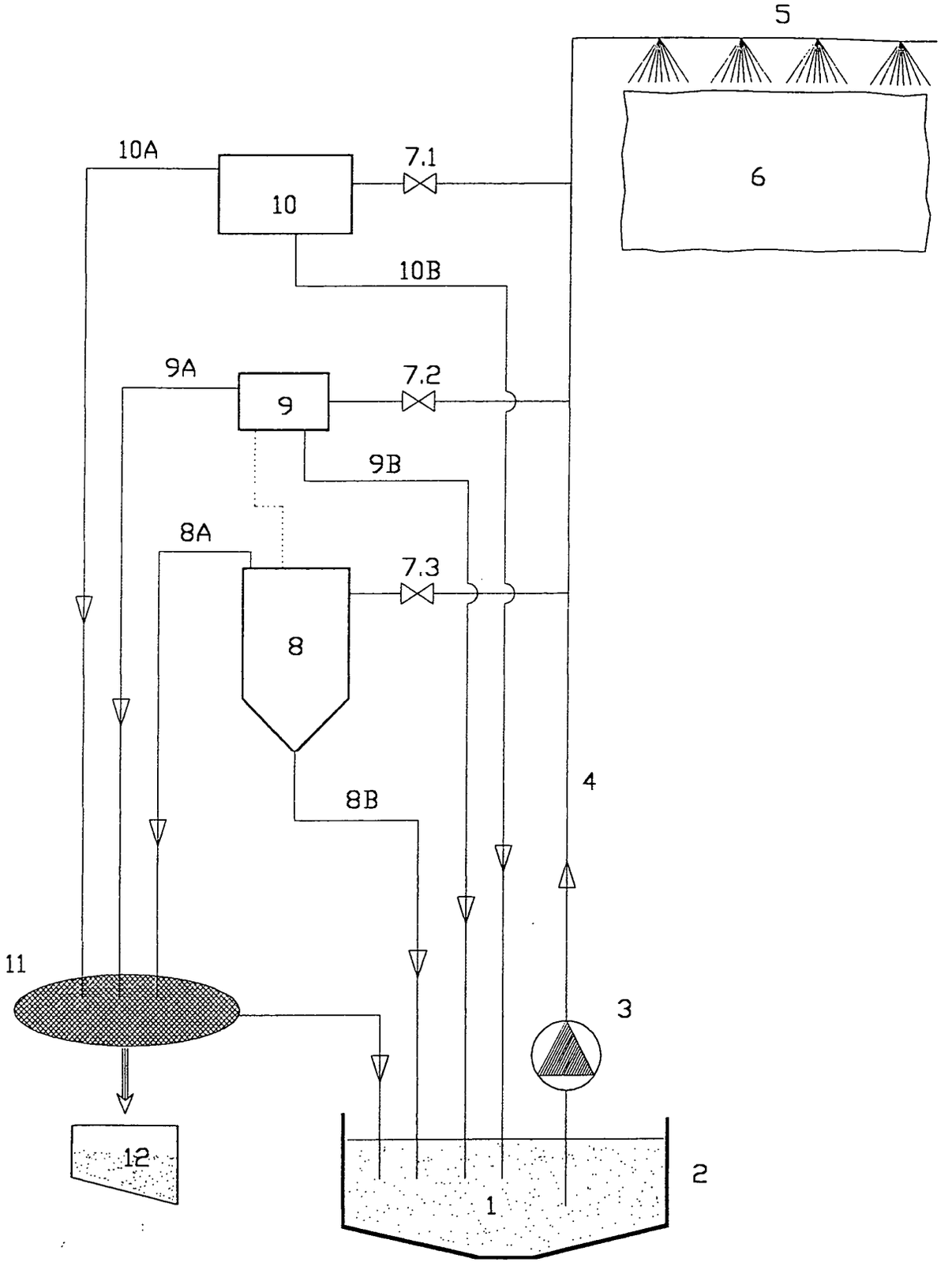

FIG.1

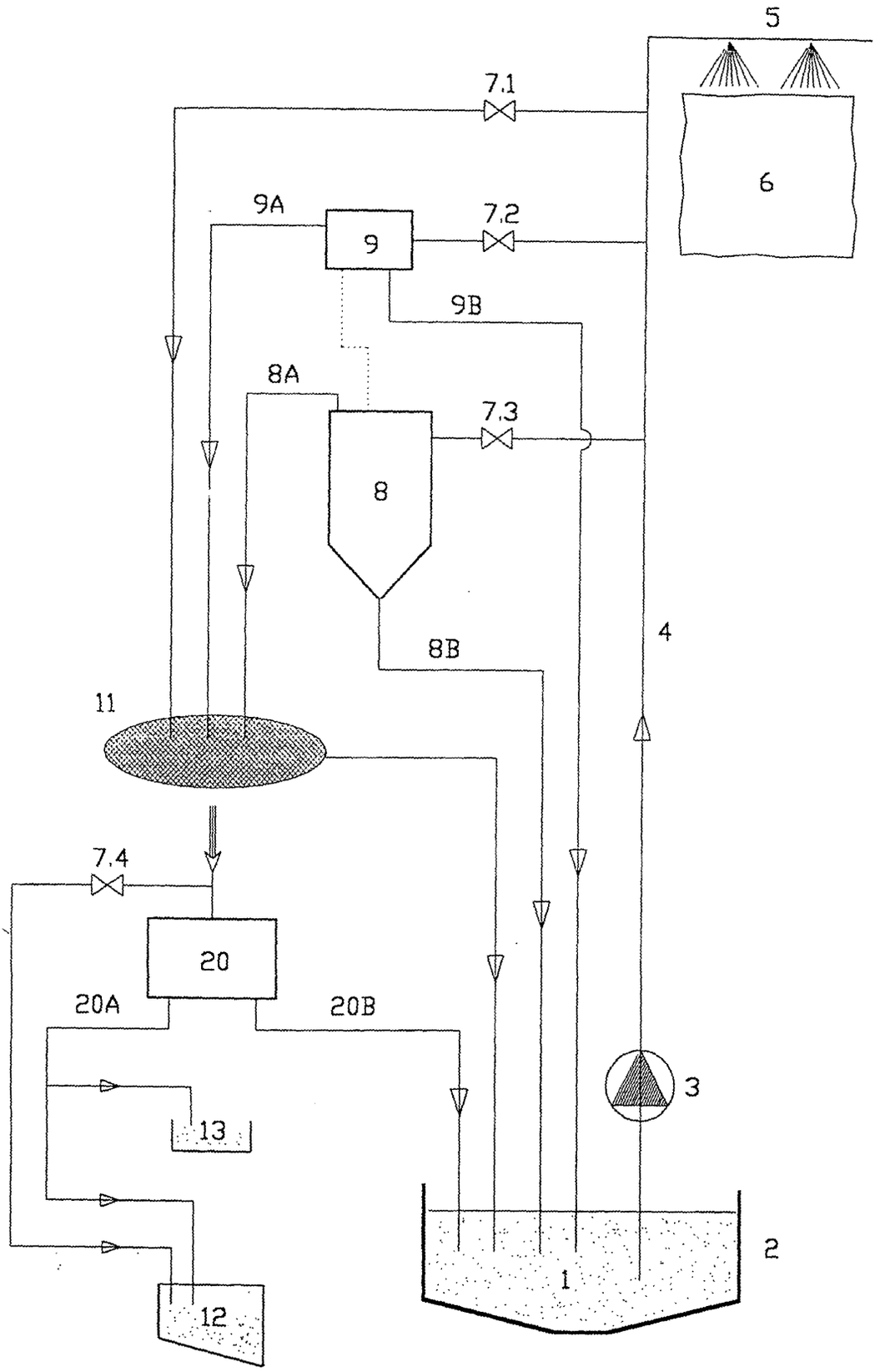

FIG.2

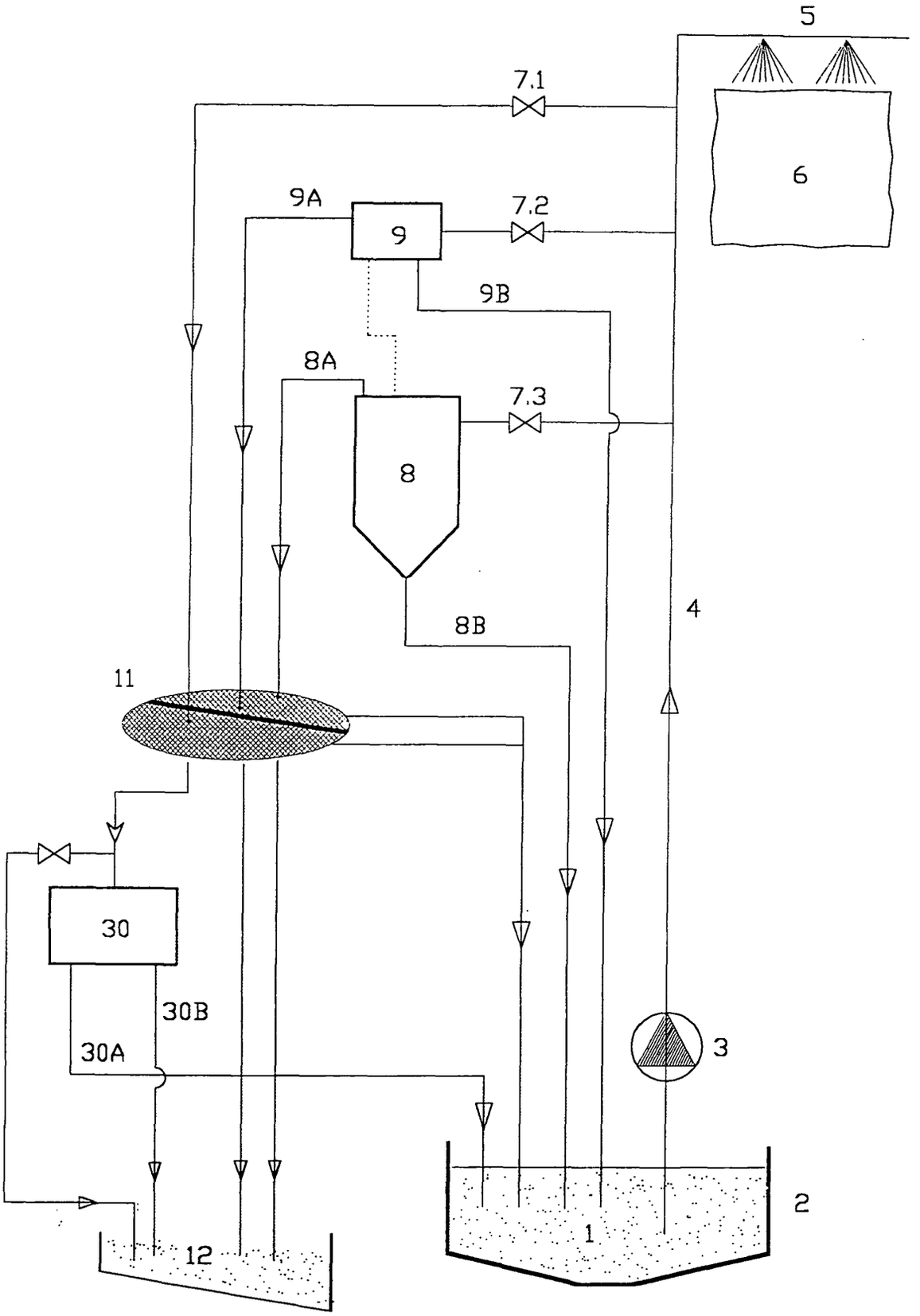

FIG.3